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Title: NMJ-on-a-chip

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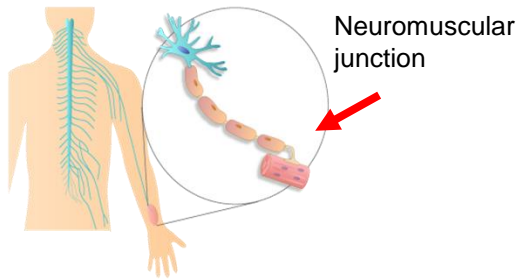
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Treating Neuromuscular Diseases

BACKGROUND & MOTIVATION

The neuromuscular junction (NMJ) is the active connection between a motor neuron and muscle. There are no simple, cheap assays for screening compounds affecting the neuromuscular junction

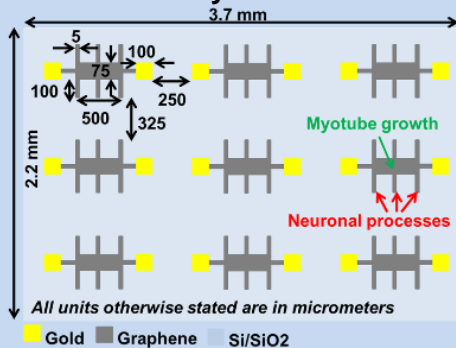


INNOVATION

Combination of cell biology and electronics

Optogenetically activated neurons

Graphene Transistor for readout of electrical activity

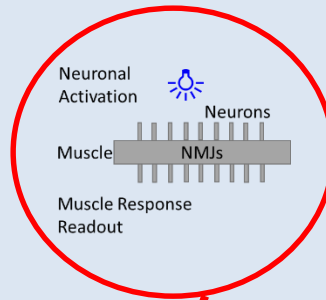


DESCRIPTION

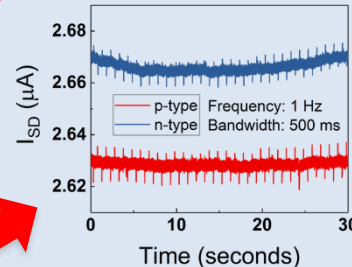
A screening platform for compounds affecting NMJ.

The approach uses the following steps:

- Patterned co-culture of muscles and neurons to form high density NMJ
- Simultaneous and nondestructive activation of neurons
- Easy readout of muscle responses through electrical activity



Direct measurement of functional output



Recordings of action potential from muscle cells

TRL3: New assay methods developed and proof of concept demonstrated: Formation of NMJ in culture, and graphene field effect transistor reading obtained.

ANTICIPATED IMPACT

NMJ-on-a-chip:

- Cell-based
- Easy to use
- Easy readout
- Cost-effective
- Long-term monitoring
- Reduces animal research

Basic research

- NMJ Development model
- NMJ Disease model

Drug screening

- Muscle relaxants
- Toxins countermeasures
- Chemical Warfare Agents countermeasures

NMJ platform

Drug testing

- Botox / Toxins
- Organophosphate

PATH FORWARD

Platform Development and Testing:

- Prototype Optimization
- Accuracy and sensitivity testing

Technology Transition:

- Develop for commercial use
- Pharmaceutical companies
- Toxin-testing

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